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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER	
PRENDERGAST, ROBERTA D	

ART UNIT	PAPER NUMBER
2628	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)
	10/533,675	CHIBA, TATSURO
	Examiner	Art Unit
	Roberta Prendergast	2628

-- *The MAILING DATE of this communication appears on the cover sheet with the correspondence address* --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-12 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-12 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on 22 December 2005 is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

Drawings

The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they include the following reference character(s) not mentioned in the description: Fig. 11 (element 16) and Fig. 20 (element 32). Corrected drawing sheets in compliance with 37 CFR 1.121(d), or amendment to the specification to add the reference character(s) in the description in compliance with 37 CFR 1.121(b) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the examiner does not accept the changes, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 101

35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

Claims 1-7, 9 and 12 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter. Claims 1-7 recite "A visualization processing system", however, the system is comprised of a program, which is considered to be descriptive material and thus the claims are directed towards nonfunctional descriptive material. Claims 9 and 12 recite "A visualization processing program", which is considered to be descriptive material and thus the claims are directed towards nonfunctional descriptive material. A computer readable medium encoded with a data structure/computer program is patent eligible subject matter if it is a computer element, which defines structure and functional interrelationships between the data structure/computer program and the computer components, which permits the data structure's/computer program's functionality to be realized. The claims are directed to descriptive material and hence are nonstatutory.

Descriptive material can be characterized as either "functional descriptive material" or "nonfunctional descriptive material." In this context, "functional descriptive material" consists of data structures and computer programs, which impart functionality when employed as a computer component. (The definition of "data structure" is "a physical or logical relationship among data elements, designed to support specific data manipulation functions." The New IEEE Standard Dictionary of Electrical and

Electronics Terms 308 (5th ed. 1993).) “Nonfunctional descriptive material” includes but is not limited to music, literary works and a compilation or mere arrangement of data.

Data structures not claimed as embodied in computer-readable material are descriptive material *per se* and are not statutory because they are not capable of causing functional change in the computer. Such claimed data structures do not define any structural and functional interrelationships between the data structure and other claimed aspects of the invention, which permit the data structure’s functionality to be realized.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

The term "reddish" in claim 5 is a relative term, which renders the claim indefinite. The term "reddish" is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention. Since color is generally represented in RGB color space any distribution of color would necessarily have some value of red thus providing a “reddish” value.

The term "reddening" in claims 10-12 is a relative term, which renders the claim indefinite. The term "reddening" is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the

art would not be reasonably apprised of the scope of the invention. Since color is generally represented in RGB color space any distribution of color would necessarily have some value of red thus providing a "reddening" value.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1, 4 and 7-9 are rejected under 35 U.S.C. 102(b) as being anticipated by Shinohara, et al., "Color image analysis in a vector field ", Canadian Conference on Electrical and Computer Engineering, 14-17 Sept. 1993, pages 23-26.

Referring to claims 1 and 4, Shinohara et al. teaches a visualization processing system (VPS 1; VPS2) characterized by a first operator (61) for mapping a vector field (70) in a three-dimensional coordinate space (80) to obtain a corresponding sequence of coordinate points (section 1 Introduction, i.e. a color image is defined as a vector field that maps a 2d pixel plane to a 3d color space such that a sequence of vector coordinate points is obtained, see fig. 1(d) thus indicating a first operator, understood to be the Jacobian matrix, for performing the mapping step), a second operator (62) for determining an elevation degree (A) in a local region of a plane connecting the sequence of coordinate points, a third operator (63) for determining a depression degree (C) in the local region of the plane connecting the sequence of coordinate

points, a fourth operator (64) for synthesizing the elevation degree (A) and the depression degree (C) in a weighting manner to determine an elevation-depression degree (B) in the local region of the plane connecting the sequence of coordinate points (section 4 Rotation and divergence in color vector field, i.e. computing the divergence of the of the vector field to obtain the scalar potential and calculating the vector curl to obtain the vector potential and calculating the magnitude of the scalar potential and vector potential is understood to be providing the 2-4th operators), and a fifth operator (65) for mapping the coordinate space (80) on a two-dimensional plane (90), providing a tone indication (F) commensurate with the elevation-depression degree to a region on the two-dimensional plane corresponding to the local region of the plane connecting the sequence of coordinate points (Figs. 1(d) and 7(c); page 25, left column bottom paragraph, i.e. depicting the 3-dimensional stream-line in the color space by superposing/mapping the coordinate space/pixel coordinates onto the 2-dimensional (a*,b*) plane and adding L* in the z-axis direction indicates the tone commensurate with the elevation-depression degree to a region on the 2d plane as claimed) wherein claim 1 is further characterized by a sixth operator (66) for determining an inclination distribution (D) of the plane connecting the sequence of coordinate points, and the fifth operator (65) providing on the two-dimensional plane a color-toned indication (F) of the inclination distribution (D), and for a brightness thereof, give the tone Figs. 1(d) and 7(c); page 25, left column bottom paragraph, i.e. the step of adding L* in the z-axis direction to indicate the tone is understood to be the sixth operator indicating the

inclination distribution and the fifth operator defines the 2d plane in the a*, b* color directions thus indicating a color-toned indication of the inclination distribution).

Referring to claims 7 and 8, claims 7 and 8 recite the elements of claims 1 and 4 and therefore the rationale for the rejection of claims 1 and 4 is incorporated herein.

Referring to claim 9, the rationale for claims 1 and 4 are incorporated herein, Shinohara et al. teaches a method of performing color image analysis in a vector field, see claims 1 and 4 above. Although Shinohara et al. does not explicitly teach that a computer executing a program is performing the method; it is implicit that the method of color image analysis being performed by the method described by Shinohara would require execution of a program by a computer is order to perform the analysis steps being described.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 2, 3, 5 and 6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shinohara et al. as applied to claims 1 and 4 above, and further in view of Kikukawa ET AL., "Solid Texturing o Riyo Shita 3-Jigen Nin'l Gamenjo ni Okeru Sensekibun Tatamikomiho", The Journal of the Institute of Image Electronics Engineers

of Japan, 25 July 2000 (25.07.00), Vol. 29, No. 4,translation and original document, pages 1-3 and 283-291.

Referring to claims 2, 3 and 6, the rationale for claim 1 is incorporated herein, Shinohara et al. teaches the system as claimed in claim 1 but does not teach wherein the elevation degree (B) (claim 2) is defined in terms of a solid angle at one side in the local region of the plane connecting the sequence of coordinate points; the depression degree (C) (claim 3) is defined in terms of a solid angle at the other side in the local region of the plane connecting the sequence of coordinate points; a seventh operator (67) for connecting, among the sequence of coordinate points, those coordinate points equivalent of an attribute in the vector field (70) to obtain an attribute isopleth line (I), and an eighth operator (68) for mapping the attribute isopleth line (I) on the two-dimensional plane (90) given the tone indication (F).

Kikukawa et al. teaches wherein the elevation degree (B) (claim 2) is defined in terms of a solid angle at one side in the local region of the plane connecting the sequence of coordinate points; the depression degree (C) (claim 3) is defined in terms of a solid angle at the other side in the local region of the plane connecting the sequence of coordinate points (translation, pages 1-3, i.e. vectors at any arbitrary position on a plane is found by interpolating vectors defined by the vertices of a triangle that includes that position, thus requiring the specification of a triangle including the intersection point and having positions on a streamline that is dropping or rising); a seventh operator (67) for connecting, among the sequence of coordinate points, those coordinate points equivalent of an attribute in the vector field (70) to obtain an attribute

isopleth line (I), and an eighth operator (68) for mapping the attribute isopleth line (I) on the two-dimensional plane (90) given the tone indication (F) (translation, pages 1-3, i.e. a 3d lattice has coordinates points covering the physical body such that streamline points are approximated as a broken line that connects a tangent extended along the vector to each cell of the lattice thus generating connecting coordinate points and generating isopleth lines, the direction toward the surface/component plane is mapped as hue, and the magnitude is mapped as saturation thus indicating that the flow lines are mapped on the 2d plane by tone).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the system and method of Shinohara et al. with the teachings of Kikukawa et al. thereby providing a very powerful Line Integral Convolution (LIC) vector field visualization technique that can effectively reveal the global and complex structures of a flow field that can extend LIC for visualizing the vector field on any arbitrary 3d surfaces, such as a contour surface or a surface of a 3d object represented implicitly as a part of a curvilinear or unstructured grid (Kikukawa et al. page 283, summary).

Referring to claim 5, the rationale for claim 4 is incorporated herein, Shinohara et al., as modified above teaches the system as claimed in claim 4, characterized in that the fifth operator (65) provides the color-toned indication (F) of the inclination distribution (D) in reddish colors (Kikukawa et al.: page 2, i.e. the direction toward the surface/component plane is mapped as hue, and the magnitude is mapped as saturation indicating that the flow lines are mapped on the 2d plane by tone such that

Dark green indicates a strong flow towards the plane and light red indicates a waek flow away from the plane thus providing a color-toned indication of the inclination distribution in reddish colors).

The rationale for combining Shinohara et al. with the teachings of Kikukawa et al. as found in the motivation statement of claims 2, 3 and 6 above is incorporated herein.

Claims 11-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shinohara et al. in view of Kikukawa et al. as applied to claims 5 and 6 above, and further in view of Hepp U.S. Patent No. 4357660.

Referring to claim 11, the rationale for claims 5 and 6 are incorporated herein, Shinohara et al., as modified above, teaches all the elements of claim 11 that are similar in scope to claims 5 and 6 but does not specifically teach a step of generating a stereoscopic contour image having contour lines connecting three-dimensional coordinates of digital data having identical Z values, a step of meshing intervals between contour lines, a step of allocating focused points to meshes, determining an average of differences in Z value between a respective mesh given a focused point and neighboring meshes, a step of meshing intervals between contour lines, and a step of allocating focused points to meshes, determining an average of differences in Z value between a respective mesh given a focused point and neighboring meshes.

Hepp teaches generating a stereoscopic contour image having contour lines connecting three-dimensional coordinates of digital data having identical Z values (Abstract, 1st paragraph; column 4, lines 28-49; column 5, lines 15-43; column 6, lines

29-68; column 7, lines 6-25; column 11, lines 1-34; column 15, lines 32-47; column 17, lines 24-39; column 21, lines 10-69, i.e. contour lines connecting 3d coordinates of digital data are generated in order to produce contour map images such that shape contour lines and contour lines connecting planes at different depths provide a contour map image stereoscopically as defined in the specification).

Kikukawa et al. teaches a step of meshing intervals between contour lines, a step of allocating focused points to meshes, determining an average of differences in Z value between a respective mesh given a focused point and neighboring meshes, a step of meshing intervals between contour lines, and a step of allocating focused points to meshes, determining an average of differences in Z value between a respective mesh given a focused point and neighboring meshes (Translation pages 1-3 and Original document, page 283, Summary; page 289, Figs. 9 and 10, i.e. i.e. a 3D mesh is generated on a contour map in order to mesh intervals between contour lines).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the system and method of Shinohara et al. with the teachings of Hepp and Kikukawa et al. thereby providing a technique for producing graphical representations of changes in dip and azimuth measurements with depth in more than one direction or plane at a time such that three-dimensional representations of formation features from measurements indicating depth, dip and azimuth are generated automatically (Hepp: column 4, lines 28-32; column 6, lines 29-39) and further providing a very powerful Line Integral Convolution (LIC) vector field visualization technique that can effectively reveal the global and complex structures of a

flow field that can extend LIC for visualizing the vector field on any arbitrary 3d surfaces, such as a contour surface or a surface of a 3d object represented implicitly as a part of a curvilinear or unstructured grid (Kikukawa et al. page 283, summary).

Referring to claim 12, the rationale for claims 9 and 11 are incorporated herein, Shinohara et al., as modified above, teaches all the elements of claim 12 that are similar in scope to claims 9 and 11 and further teaches a program causing a computer to execute the method of claim 11 (see the rationale for claim 9 regarding Shinohara et al. and Kikukawa et al; Hepp: columns 9-10, lines 65-15; column 10, lines 33-59; columns 21-22, lines 65-4).

The rationale for combining Shinohara et al. with the teachings of Kikukawa et al. and Hepp as found in the motivation statement of claim 11 above is incorporated herein.

Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Shinohara et al. in view of Kikukawa et al. and Hepp as applied to claims 11 and 12 above, and further in view of Gutierrez et al. U.S. Patent No. 6915310.

Referring to claim 10, the rationale for claims 11 and 12 are incorporated herein, Shinohara et al., as modified above, teaches all the elements of claim 10 that are similar in scope to claims 11 and 12 but does not specifically teach the visualization processing system (VPS1) for generating a gradient reddening stereoscopic image, characterized by a database having stored therein a multiplicity of digital data provided with three-dimensional coordinates.

Gutierrez et al. teaches this limitation (Abstract; Figs. 1-2; column 1, lines 24-36; column 2, lines 24-38; column 3, lines 7-39 and 49-59; column 5, lines 16-34).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the system and method of Shinohara et al. with the teachings of Hepp, Kikukawa et al. and Gutierrez et al. thereby providing a technique for producing graphical representations of changes in dip and azimuth measurements with depth in more than one direction or plane at a time such that three-dimensional representations of formation features from measurements indicating depth, dip and azimuth are generated automatically (Hepp: column 4, lines 28-32; column 6, lines 29-39), providing a very powerful Line Integral Convolution (LIC) vector field visualization technique that can effectively reveal the global and complex structures of a flow field that can extend LIC for visualizing the vector field on any arbitrary 3d surfaces, such as a contour surface or a surface of a 3d object represented implicitly as a part of a curvilinear or unstructured grid (Kikukawa et al. page 283, summary), and further providing a 3D geo-spatial database storing a multiplicity of digital data having three-dimensional coordinates that can support 3D, volumetric, geo-spatial querying such that three-dimensional mapping can be applied in order to clearly and advantageously provide three-dimensional visualization and analysis of geographic data (Gutierrez et al.: column 1, lines 8-23; column 2, lines 11-37).

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

The following patents are cited to further show the state of the art with respect to contour mapping and/or gradient imaging.

Moellering et al. U.S. Patent No. 5067098

Bates et al. U.S. Patent No. 5357484

Butler et al. U.S. Patent No. 5452406

Schuler et al. U.S. Patent No. 5552787

OnoU.S. Patent No. 5604820

Rao U.S. Patent No. 5631981

Willhoit, Jr. U.S. Patent No. 5671136

Montgomery et al. U.S. Patent No. 5825188

Thomas U.S. Patent No. 6073079

Brockway et al. U.S. Patent No. 6456288

Socolinsky et al. U.S. Patent No. 6539126

Castellar et al. U.S. Patent No. 6735557

Prakash et al. U.S. Patent No. 6778698

Wilkinson U.S. Patent No. 6985606

Docherty U.S. Patent No. 6989841

Rappaport et al. U.S. Patent No. 7164833

Malmros et al. U.S. Patent No. 2003/0026762

The following patents are cited to further show the state of the art with respect to Line Integral Convolution (LIC).

Spicer U.S. Patent No. 7151545

Laidlaw et al. U.S. Patent No. 2003/0234781

The following non-patent literature is cited to further show the state of the art with respect to Line Integral Convolution (LIC).

Cabral, et al., "Imaging Vector Fields Using Line Integral Convolution", *Proceedings of the 20th Annual Conference on Computer Graphics and interactive Techniques,* SIGGRAPH '93, ACM, New York, NY, pages 263-270.

Helman, J.L.; Hesselink, L.; "Visualizing vector field topology in fluid flows", IEEE Computer Graphics and Applications, Volume 11, Issue 3, May 1991, pages 36-46.

Hotz, I., "Isometric embedding by surface reconstruction from distances", *Proceedings of the Conference on Visualization '02,* October 27 - November 01, 2002, VISUALIZATION, IEEE Computer Society, Washington, DC, pages 251-258.

Interrante, V.; Grosch, C.; "Visualizing 3D flow", IEEE Computer Graphics and Applications, Volume 18, Issue 4, July-Aug. 1998, pages 49-53.

Han-Wei Shen; Kao, D.L., "A new line integral convolution algorithm for visualizing time-varying flow fields", *Transactions on Visualization and Computer Graphics*, Volume: 4, Issue: 2, Apr-Jun 1998, page(s): 98-108.

Han-Wei Shen; Johnson, C.R.; Kwan-Liu Ma; "Visualizing vector fields using line integral convolution and dye advection", Proceedings 1996 Symposium on Volume Visualization, 28-29 Oct. 1996, pages 63-70, 102.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Roberta Prendergast whose telephone number is (571) 272-7647. The examiner can normally be reached on M-F 7:00-4:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ulka Chauhan can be reached on (571) 272-7782. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

UChauhan
ULKA CHAUHAN
SUPERVISORY PATENT EXAMINER

RP 1/10/2008